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10/600,273	06/20/2003	Qinghong K. Gao	015290-704	6096

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EXAMINER

DHINGRA, RAKESH KUMAR

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 03/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/600,273

Applicant(s)

GAO ET AL.

Examiner

Rakesh K. Dhingra

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 January 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 and 21-30 is/are pending in the application.
- 4a) Of the above claim(s) 29 and 30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 and 21-28 is/are rejected.
- 7) ☒ Claim(s) 1 and 8 is/are objected to.
- 8) ☒ Claim(s) 1-11, 21-30 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

Art Unit: 1763

DETAILED ACTION

Election/Restrictions

Newly submitted claims 29, 30 directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: the apparatus as claimed can be used for processing a non-wafer substrate in a semiconductor processing chamber.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 29, 30 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Objections

1) Claim 1 was objected to because of the following informalities:

In last paragraph recited as "inner and outer zone bleed lines ----- for pressure release" it is suggested as given below -

a) In line 2 replace "lines between" with "lines respectively between", and

2) Claim 8 objected to because of the following informalities:

In paragraph 5 recited as "first and second zone bleed lines ----- for pressure release" it is suggested as given below -

a) In line 2 replace "lines between" with "lines respectively between", and

Appropriate correction is required.

Art Unit: 1763

3) Claims 16, 17 have not been provided with proper status identifier and as such the individual status of each claim can not be identified.

Note: The status of every claim must be indicated after its claim number by using one of the following status identifiers : (Original), (Currently amended), (Cancelled), (Previously presented), (New), (Not entered), (Withdrawn), (Withdrawn-currently amended).

In this case claims 16, 17 should have the status identifier as “(Withdrawn)” instead of “(Previously presented)”.

Response to Arguments

Applicant's arguments with respect to claim 1-11, 21-24 have been considered but are moot in view of the new ground(s) of rejection due to following:

Applicant has amended claims 1, 5, 7, 8, 12 and 13 and added new claims 25-30.

Claims 1-11, 21-28 have been rejected under 35 USC 103 (a) as explained below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under

Art Unit: 1763

37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-7, 21, 22, 25, 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shamouilian et al (US Patent No. 6,320,736) in view of Moriya et al (US Patent No. 5,439,026) and Matsuda et al (US Patent No. 6,254,683).

Regarding Claims 1, 21, 25: Shamouilian et al teach a multiple zone gas distribution apparatus (Figures 1-3, 5) for controlling temperature across a workpiece during processing, the apparatus comprising:

a chuck 28 (surrounded by a semiconductor wafer processing chamber 6) having a top face 27 configured to hold a substrate (work piece) 4 during processing, the chuck top face defining inner and outer zones 56a, 56c between the top face of the chuck and the workpiece into which zone coolant gas may be admitted;

inner and outer zone feed lines 50b, 50a for feeding the coolant gas to the inner and outer zones of the chuck;

a pressure and flow control system 55 (pressure sensors 64a, 64, flow controllers 62a, 62b and pressure control valves 66a, 66b) for supplying zone coolant gas to the feed lines with separate pressures for the inner and outer zones controlled to control the temperature across the workpiece;

and inner and outer zone bypass (bleed) lines (with bypass valves 76b, 76a) connected to the respective inner and outer zone feed lines between the pressure and flow control

Art Unit: 1763

system and the chuck; the inner zone bleed line having a connecting line in fluid communication with the outer zone bleed line (Column 4, line 10 to Column 5, line 15 and Column 7, lines 19-42).

Shamouilian et al do not teach fixed orifice adapted to continuously bleed the pressure of inner zone and an evacuation valve adapted to bypass the fixed orifice.

Moriya et al teach a gas flow apparatus (Figures 3, 6) for semiconductor wafer processing that includes a straightening vein (fixed orifice) 43 in the gas flow path 33 so as to ensure flow of gas at a predetermined flow rate (Column 6, line 65 to Column 7, line 7).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to add fixed orifice in the inner zone bleed line (along the connecting line) as taught by Moriya et al in the apparatus of Shamouilian et al to ensure flow of gas at a predetermined flow rate.

Shamouilian et al in view of Moriya et al teach a fixed orifice in the connecting line between inner and outer bleed line but do not teach evacuation valve in inner zone bleed line that by-passes the fixed orifice.

Matsuda et al teach an apparatus (Figure 1) that has an evacuation line 19 with a cut-off (evacuation) valve 41 that bypasses the by-pass line 17a (with a fixed orifice as per Shamouilian et al in view of Moriya et al) to enable faster evacuation (Column 7, lines 12-19 and Column 6, lines 50-65). Matsuda et al further teach that in this apparatus two or more lines for heat conductive gas (for inner and outer zones) may be used (Column 7, lines 45-48) as per process requirement.

Art Unit: 1763

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use evacuation valve in inner zone bleed line that bypasses fixed orifice as taught by Matsuda et al in the apparatus of Shamouilian et al in view of Moriya et al to reduce evacuation time (Column 6, lines 45-60).

Regarding Claim 2: Shamouilian et al teach that outer zone bleed line has a bypass (evacuation) valve 76a that can be adapted to be closed during workpiece processing and during that time the pressure bleeds between the chuck and the workpiece to the surrounding chamber.

Per Case Law: "A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987)."

Also per Case Law: "Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). Apparatus claims cover what a device is, not what a device does *Hewlett-Packard Co. V. Bausch & Lomb Inc.*, 15USPQ2d 1525, 1528 (Fed. Cir. 1990)".

Regarding Claims 3, 4: Shamouilian et al teach that the inner and outer zones 56a, 56c are concentric circular zones with plurality of holes 40a, 40b arranged on circular pattern for delivery of coolant gas (Figures 3, 7 and Column 6, lines 20-30 and Column 7, lines 45-60).

Art Unit: 1763

Regarding Claim 5: Shamouilian et al teach that the inner and outer zones of the chuck top face include at least one shallow circular groove (between protrusions 44) to provide easy flow of coolant gas from the plurality of holes in a circular direction along the underside of the wafer (Figures 1, 2).

Regarding Claim 6: Shamouilian et al teach that the pressure and flow control system 55 is adapted to control the supply of zone coolant gas to the feed lines to achieve different pressures in the inner and outer zones throughout the processing of a workpiece to control the temperature across the workpiece (Column 2, lines 9-12 and Column 7, lines 19-42).

Regarding Claim 7: Matsuda et al teach (Figure 1) that the apparatus has an evacuation line 19 with a cut-off (evacuation) valve 41 and a by-pass line 17a with cut-off (evacuation) valve 43 to enable faster evacuation and improve throughput (Column 7, lines 12-19 and Column 6, lines 50-65) and that by-pass line 17b provides an additional path for evacuation. Evacuation time of 5 seconds or less is process limitation and the disclosed apparatus is capable of being operated under conditions claimed by adjusting by-pass valves.

Regarding Claim 22: Shamouilian et al teach that the inner zone bleed line is adapted to be bled via the connecting line and the outer zone bleed line (Figure 5).

Regarding Claim 26: Matsuda et al teach that the apparatus (Figure 1) is a plasma etching apparatus (Column 6, lines 40-45).

Claims 8–11, 23, 24, 27, 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shamouilian et al (US Patent No. 6,320,736) in view of Moriya et

Art Unit: 1763

al (5,439,026) and Matsuda et al (US Patent No. 6,254,683) and further in view of Ito et al (JP 10163308 A).

Regarding Claim 8: Shamouilian et al teach a multiple zone gas distribution apparatus (Figures 1-3, 5) for controlling temperature across a workpiece during processing, the apparatus comprising:

a chuck 28 (surrounded by a semiconductor wafer processing chamber 6) having a top face 27 configured to hold a substrate (work piece) 4 during processing, the chuck top face defining first and second zones 56a, 56c between the top face of the chuck and the workpiece into which zone coolant gas may be admitted;

first and second zone feed lines 50b, 50a for feeding the coolant gas to the first and second zones of the chuck;

a pressure and flow control system 55 (pressure sensors 64a, 64, flow controllers 62a, 62b and pressure control valves 66a, 66b) for supplying zone coolant gas to the feed lines with separate pressures for the first and second zones controlled to control the temperature across the workpiece;

and first (inner) and second (outer) zone bypass (bleed) lines (with bypass valves 76b, 76a) connected to the respective first and second zone feed lines between the pressure and flow control system and the chuck; the first zone bleed line having a connecting line in fluid communication with the second zone bleed line (Column 4, line 10 to Column 5, line 15 and Column 7, lines 19-42).

Shamouilian et al do not teach fixed orifice adapted to continuously bleed the pressure of first zone and an evacuation valve adapted to bypass the fixed orifice.

Art Unit: 1763

Moriya et al teach a gas flow apparatus (Figures 3, 6) for semiconductor wafer processing that includes a straightening vein (fixed orifice) 43 in the gas flow path 33 so as to ensure flow of gas at a predetermined flow rate (Column 6, line 65 to Column 7, line 7).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to add fixed orifice in the first zone bleed line (along the connecting line) as taught by Moriya et al in the apparatus of Shamouilian et al to ensure flow of gas at a predetermined flow rate.

Shamouilian et al in view of Moriya et al teach a fixed orifice in the connecting line between first and second bleed line but do not teach evacuation valve in first zone bleed line that by-passes the fixed orifice.

Matsuda et al teach an apparatus (Figure 1) that has an evacuation line 19 with a cut-off (evacuation) valve 41 that bypasses the by-pass line 17a (with a fixed orifice as per Shamouilian et al in view of Moriya et al) to enable faster evacuation (Column 7, lines 12-19 and Column 6, lines 50-65). Matsuda et al further teach that in this apparatus two or more lines for heat conductive gas (for inner and outer zones) may be used (Column 7, lines 45-48) as per process requirement.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use evacuation valve in first zone bleed line that bypasses fixed orifice as taught by Matsuda et al in the apparatus of Shamouilian et al in view of Moriya et al to reduce evacuation time (Column 6, lines 45-60).

Art Unit: 1763

Shamouilian et al in view of Moriya et al and Matsuda et al do not teach pressure and flow control system providing a signal indicating de-chucking.

Ito et al teach an apparatus (Figure 1-3) that has a Controller 18 that facilitates release of wafer 7 by using a set value, which is reaction difference between electrostatic attraction and backside pressure of Helium (Abstract).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a controller as taught by Ito et al that would use the pressure difference signal and provide control of power output of the power source as taught by Ito et al in the apparatus of Shamouilian et al in view of Moriya et al and Matsuda et al to facilitate release (de-chucking) of wafer.

Regarding Claims 9, 10: Shamouilian et al teach that the first and second (inner and outer zones) 56a, 56c are concentric circular zones with plurality of holes 40a, 40b arranged on circular pattern for delivery of coolant gas (Figures 3, 7 and Column 6, lines 20-30 and Column 7, lines 45-60).

Regarding Claim 11: Shamouilian et al teach that the second (outer) zone bleed line has a bypass (evacuation) valve 76a that can be adapted to be closed and during that time the pressure bleeds between the chuck and the workpiece to the surrounding chamber.

Per Case Law: "A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural

Art Unit: 1763

limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987)."

Also per Case Law: "Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). Apparatus claims cover what a device is, not what a device does *Hewlett-Packard Co. V. Bausch & Lomb Inc.*, 15USPQ2d 1525, 1528 (Fed. Cir. 1990)".

Regarding Claim 23: Shamouilian et al in view of Moriya et al teach that fixed orifice 43 (Moriya et al) is positioned along the connecting line between inner and outer zone bleed lines (Figure 5).

Regarding Claim 24: Shamouilian et al teach that the first (inner) zone bleed line is adapted to be bled via the connecting line and the second (outer) zone bleed line (Figure 5).

Regarding Claim 27: Shamouilian et al teach that chuck 28 is surrounded by a semiconductor wafer processing chamber 6 for processing a semiconductor wafer 4 held on the top face of the chuck (Column 3, lines 15-50).

Regarding Claim 28: Matsuda et al teach that the apparatus (Figure 1) is a plasma etching apparatus (Column 6, lines 40-45).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

Art Unit: 1763

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Rakesh K Dhingra



Parviz Hassanzadeh
Supervisory Patent Examiner
Art Unit 1763